

# **INDICATION STRUCTURE FOR PAPER RESERVES ADAPTED FOR AUTO DOCUMENT FEED APPARATUS**

## **BACKGROUND OF THE INVENTION**

### **5    Field of the Invention**

The present invention relates to an indication structure for paper reserves, and in particular to an indication structure for paper reserves for use in an auto document feed apparatus that can provide an indication of paper reserves.

### **10   Description of the Prior Art**

Following the upgraded rapidly of the industry, and the times of knowledge economic coming, such that the people use paper, files and messages in writing, which dealing with each other is more frequently; each type of the printers, copy writers, fax machines or auto document feed apparatuses has been the major  
15   product for modern. Therefore, high added value, high resolution, light, cost cheap and fabrication convenience has been a major index for choosing.

Reference is made to FIG. 1, which illustrates an indication structure for paper reserves. The indication structure is adapted for use in accord with the prior art printers, copiers, fax machines or auto document feed apparatuses. The  
20   indication structure for paper reserves has a support plate 11a for receiving paper.

Support plate 11a contacts a spring 12a. The bottom of the support plate 11a has a hook 13a. The indication structure for paper reserves has a cord 1a and cord 1a has a first end and a second end, of which the first end links to the hook 13a. A support shaft 2a connects to a housing 14a of the auto document feed apparatus to allow the cord 1a to slide thereon. A slide 3a links to the second end of the cord 1a and slide 3a has a paper reserves indication pin 31a thereon to indicate the paper reserves. A guide shaft 4a is vertically arranged on the housing 14a of the auto document feed apparatus to allow the slide 3a to slide thereon. Support plate 11a compresses spring 12a and influences cord 1a to make slide 3a slide on the guide shaft 4a when the paper reserves in the support plate 11a of the auto document feed apparatus are high. As paper reserves decrease, the support plate 11a moves gradually upward due to a force of the spring 3a, thereby causing the paper reserves indication pin 31a to indicate the amount of paper reserves.

Reference is made to FIG. 2, in which another indication structure for paper reserves adapted for auto document feed apparatus is illustrated in accord with the prior art. The indication structure for paper reserves has a support plate 1a' for receiving paper and a lead screw 2a' contacts the bottom of the support plate 1a' to provide the support plate 1a' for displacement upward or downward. A drive motor 3a' is located on a side of the lead screw 2a', the drive motor has at least one gear, to provide the lead screw 2a' rotationally contacted therewith. A

sensor 4a' is located on a top side of the support plate 1a' to provide pressure measurement. A feedback signal control module for drive motor 5a' contacts the drive motor 3a' or the sensor 4a' electrically. Thereby, a program design of the feedback signal control module for drive motor 5a' controls, while the paper do  
5 not reach the prediction high of paper, then paper do not touch the pressure sensor 4a', at the same time the sensor 4a' provides an electrical signal for the feedback signal control module for drive motor 5a', (which is) dealt by the program design of the feedback signal control module for drive motor 5a', to output a electrical signal to the drive motor 3a' which driven the lead screw 2a'  
10 to generate a displacement upward, making the paper arranges on the support plate 1a' to reach and touch the pressure sensor 4a', so that using the sensor 4a' to detect the variation of the paper reserves, providing a electrical signal for the feedback signal control module for drive motor 5a', dealt by the program design of the feedback signal control module for drive motor 5a', to output a prediction  
15 known ideal value signal to the drive motor 3a', thereby, to reach the purpose of automatic detecting paper reserves.

Moreover, the taught indication structure for paper reserves adapted for auto document feed apparatus as above description, (which is) providing a function of the paper reserves for showing or detecting, however, due to some manufacture  
20 technology limitations, more work pieces cause to be restricted of manufactured

cost and fabrication on production line, and the mechanical complexity increases, too. Thereof, (it is) the qualities of taught manufacture technology limitations, such that the indication structure for paper reserves adapted for auto document feed apparatus can not be easily fabricated and fast maintained; thus the  
5 manufactured cost will be also increased.

Following the upgraded rapidly of the industry, such that the life of humans is also changed; fast, convenient, easy, light, handy and cheap is a code word of the modern. However, the taught indication structure for paper reserves adapted for auto document feed apparatus is unfavorable to repair, replace and maintain.

10 Simultaneously, the manufactured cost and the difficulty of fabrication are increased, too. Today the requirements of indication structure for paper reserves adapted for auto document feed apparatus known in the prior art could not be reached.

Further, in according to the Kennedy's theorem or the Grashof's theorem of  
15 the Mechanical Engineering, we know that a multi-bar linkage system (generally above four-bar linkage) often has a plurality of instantaneous center or multi-degree of freedom thereon. Consequently, requires the higher precision for fabricating or arranging the mechanical system, the manufactured cost and the difficulty of fabrication increases, too.

Accordingly, as above description we knowing the indication structure for paper reserves adapted for auto document feed apparatus known in the prior art having exists a non-convenience and defect in using practically.

Therefore, the present invention is directed to an improved the indication  
5 structure for paper reserves adapted for auto document feed apparatus with the inventor's research hardly and the application of theorem having a reasonable design and lower manufactured cost thereon.

### **SUMMARY OF THE DISCLOSURE**

10 It is an object of the present invention to provide an indication structure for paper reserves adapted for auto document feed apparatus, for achieving the function of indicating paper reserves with more simplistic, and further corresponds to the micro scale trend, thereby decreasing the cost of fabrication and manufacture.

15 In order to achieve the above objective of the invention that providing an indication structure for paper reserves adapted for an auto document feed apparatus has a housing, at least one opening is arranged thereon, a support element is received in the housing, an elasticity element fixedly is positioned between the housing and the support element, to contact with the support element  
20 elastically, a delivered module is received in the housing, to convey or deliver

paper; the indication structure for paper reserves is comprising: an indication element having a transmission roller pivotally connected with the housing, an indication roller is arranged on a side of the transmission roller and pivotally connected with the housing; a belt is fixedly contacted with the transmission roller and the indication roller, for providing a transmission or an indication.

In the cause of examiner or judge can further knowing in other objects, features and technological subject matters of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings. However, the present examples and embodiments are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

### **BRIEF DESCRIPTIONS OF THE DRAWINGS**

The present invention can be fully understood from the following detailed description and preferred embodiment with reference to the accompanying drawings in which:

FIG.1 is a perspective view of a conventional indication structure for paper reserves adapted for auto document feed apparatus;

FIG.2 is a perspective view of another conventional indication structure for paper reserves adapted for auto document feed apparatus;

FIG.3 is a perspective view according to an embodiment of the present invention; and

FIG.4 is a perspective view according to another embodiment of the present invention.

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### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

The following detailed description is of the best presently contemplated modes of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating general principles of embodiments of the invention. The scope of the invention is best defined by the appended claims.

Although the embodiments of the present invention are described below in connection with an indication structure for paper reserves adapted for auto document feed apparatus, the present invention can be applied to all auto document feed apparatus, including but not limited to auto document feed devices, printers, copy writers, fax machines, as well as all other auto document feed apparatus and feed paper machines.

Please refer to FIG. 3 illustrates an indication structure for paper reserves adapted for auto document feed apparatus, wherein the auto document feed apparatus has a housing 1, at least one opening 11 is arranged thereon, a support

element 2 is received in the housing 1, for receiving paper therein, a side of the support element 2 pivotally connects to the housing 1, for providing the support element 2 vibration on the pivotal portion; an elasticity element 3 is a spring or a spring band fixedly positioned between the housing 1 and the support element 2, to contact with the support element 2 elastically, which is providing a suitable elasticity for the support element 2; a hamper 21 protrudes from the top side of support element 2, to withstand the paper on the support element 2, for providing a reaction force, which is equal to an elasticity force generated by the spring 3. A delivered module (not shown) is received in the housing 1, to convey or deliver paper; a printer module (not shown) is arranged on the paper output of the delivered module for printing.

The indication structure can be adjacent to the opening 11 for paper reserves and includes an indication element 4 further having a transmission roller 41, an indication roller 42 and a belt 43. A central pivotal shaft of the transmission roller 41 pivotally connects with the housing 1, and the transmission roller 41 has a protrusion portion 411, which extends from a side surface of the transmission roller 41 and contacts with the support element 2, thereby, the protrusion portion 411 is not located at the same axis with the central pivotal shaft of the transmission roller 41, so that a moment force can be generated, to provide a angular displacement with the transmission roller 41 while the support element 2



has a displacement with the paper reserves variation. A circumferential surface of the transmission roller 41 has a groove 412 thereon; a circumferential surface of the indication roller 42 also has a groove 421, and the indication roller 42 is arranged on a side of the transmission roller 41 or is pivotally connected with the housing 1. The belt 43 has at least one smooth surface thereon, fixedly contacted with the transmission roller and the indication roller, for providing a transmission therebetween. A side of the belt 43 has an indication mark for indication. A transparent element 5 is a piece of optical transparent plastic or optical glass, mounted on the opening 11 of the housing 1, further including a measure line or a notch thereon, whereby, it is convenience for user to observe directly and exactly to know the paper reserves of the auto document feed apparatus form outside while use.

Please refer to FIG. 4 illustrates another indication structure for paper reserves adapted for auto document feed apparatus, wherein the indication structure for paper reserves includes an indication element 4' further having a transmission roller 41', an indication roller 42' and a belt 43'. A central pivotal shaft of the transmission roller 41' pivotally connects with the housing 1, and the transmission roller 41' has a protrusion portion 411', which extends from a side surface of the transmission roller 41' and contacts with the support element 2, thereby, the protrusion portion 411' is not located at the same axis with the

central pivotal shaft of the transmission roller 41', so that a moment force can be generated, to provide a angular displacement with the transmission roller 41' while the support element 2 has a displacement with the paper reserves variation.

A circumferential surface of the transmission roller 41' has a plurality of teeth

5 portion 412' thereon; a circumferential surface of the indication roller 42' also has a plurality of teeth portions 421', and the indication roller 42' is arranged on a side of the transmission roller 41' or is pivotally connected with the housing 1.

The belt 43' has a plurality of teeth portions thereon, fixedly contacted with the transmission roller 41' and the indication roller 42', for providing a transmission

10 therebetween. A side of the belt 43' has an indication mark for indication. A transparent element 5 is a piece of optical transparent plastic or optical glass, mounted on the opening 11 of the housing 1, further including a measure line or a notch thereon, whereby, it is convenience for user to observe directly and exactly to know the paper reserves of the auto document feed apparatus form outside  
15 while use.

A prototype of indication structure for paper reserves adapted for auto document feed apparatus has been constructed herein with features as above descriptions, the present invention is using the most simplistic mechanical

structure, decreasing the manufactured cost and time of fabrication substantially,  
20 to increase the convenience for using, fabrication and repair. Simultaneously, the

present invention eliminates and saves more mechanical structures or elements than the conventional multi-bar linkage mechanical apparatus and obtains the equality function or even better, and saves more space. So that the present invention improves the defect of the known indication structure for paper

5 reserves adapted for auto document feed apparatus in prior art that cannot effectively decrease higher manufactured cost and longer time of fabrication and maintainability, moreover, the present invention also reduces the volume of the indication structure for paper reserves to correspond with the fashion of modern.

Although particular embodiment of the invention has been described in  
10 detail for purpose of illustration, various modifications and enhancements maybe made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.